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TECHNICAL FIELD

[Field of the Invention]Especially this invention relates to the conveying machine of the optical disc in an optical disk manufacturing process about a disc shaped substrate conveying machine.

PRIOR ART

[Description of the Prior Art]The cooling process and stoving process of the substrate are included in the manufacturing process of CD-R and rewritable CD-RW which can be added also in a compact disk. DVD of the mass media which will spread from now on is also completely the same. The cooling process and stoving process of this substrate usually take the time for tens of [several to] minutes. However, since CD and the production tact of a DVD medium are usually several seconds, they will put about 100 substrates into the cooling process or the stoving process. The conveyance gestalt of thin disc shaped substrates, such as CD and DVD, has a common transportation method common [every / which is performed where it made the substrate common and it is placed]. however, the length of a process [in / common / every / this / with a transportation method / a cooling process or a stoving process] -- if it forces, the size of the whole device will become huge. Then, in these processes, in order to pack a substrate interval, the transportation method is adopted every [which conveys a substrate in the state where it stood vertically] length. However, every length of this, by a transportation method, if the distance between substrates is packed too much, ventilation will worsen and cooling or the stoving effect will decrease. For this reason, where a substrate is stood, in order to maintain a substrate interval suitable, a magazine cassette and the jig held where one substrate is stood are arranged to a constant interval, and the substrate conveying method of the carousel type to which that magazine cassette and jig are moved is used.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in these methods, there is a problem that substrate temperature will not become uniform since the fixed state of a substrate is constant, and device size will become large. There is a lamination process that nothing is to CD in DVD, there are some which need the cure time for tens of minutes according to the kind of adhesives used at this process, predetermined time storage must be carried out and the too same problem as **** is in the process in that case, and a device.
[0004]This invention is for solving these problems.
The purpose is to provide the disc shaped substrate conveying machine which can hold an always suitable substrate interval, rotating a substrate.

MEANS

[Means for Solving the Problem]Two or more feed screws arranged in parallel to a longitudinal direction of a medial axis of a disc shaped substrate so that a peripheral end of a disc shaped substrate stood perpendicularly may intervene between screw threads, in order that this invention may solve said problem, Conveying having a rotational driving means which carries out axial rotation, rotating each feed screw at the same speed by a rotational driving means, and making the same transportation direction rotate a disc shaped substrate has the feature. Therefore, during conveyance, since a substrate is always rotating, substrate temperature can be heated or cooled uniformly, and the whole device can be miniaturized.
[0006]By making shape of a thread groove of a feed screw into symmetrical shape to a perpendicular direction, giving stress unnecessary for a substrate can be lost, curvature of a substrate, distortion, etc. can be prevented, and a substrate which has the good characteristic can be manufactured.
[0007]By changing a screw pitch of a feed screw in a predetermined field, a screw pitch of a feed screw in a carrying path of processes, such as an injection and discharge, can be made large, for example, distance between substrates can be maintained, and a substrate in processes, such as an injection and discharge, can be taken in and out easily.
[0008]
[Embodiment of the Invention]Two or more feed screws arranged in parallel to the longitudinal direction of the medial axis of a disc shaped substrate so that the peripheral end of the disc shaped substrate stood perpendicularly may intervene between screw threads, It has a rotational driving means which carries out axial rotation, and it conveys, rotating each feed screw at the same speed, and making the same transportation direction rotate a disc shaped substrate by a rotational driving means.

EFFECT OF THE INVENTION

[Effect of the Invention]Two or more feed screws arranged in parallel to the longitudinal direction of the medial axis of a disc shaped substrate so that the peripheral end of the disc shaped substrate stood perpendicularly may intervene between screw threads

according to this invention, as explained above, Conveying having a rotational driving means which carries out axial rotation, rotating each feed screw at the same speed by a rotational driving means, and making the same transportation direction rotate a disc shaped substrate has the feature. Therefore, during conveyance, since the substrate is always rotating, substrate temperature can be heated or cooled uniformly, and the whole device can be miniaturized.

[0020]By making shape of the thread groove of a feed screw into symmetrical shape to a perpendicular direction, giving stress unnecessary for a substrate can be lost, the curvature of a substrate, distortion, etc. can be prevented, and the substrate which has the good characteristic can be manufactured.

[0021]By changing the screw pitch of a feed screw in a predetermined field, the screw pitch of the feed screw in the carrying path of processes, such as an injection and discharge, can be made large, for example, the distance between substrates can be maintained, and the substrate in processes, such as an injection and discharge, can be taken in and out easily.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a schematic diagram showing the composition of the disc shaped substrate conveying machine concerning the 1st example of this invention.

[Drawing 2]It is a sectional view of a feed screw.

[Drawing 3]It is a sectional view showing the example of arrangement of the feed screw of the disc shaped substrate conveying machine concerning the 2nd example of this invention.

[Drawing 4]It is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 2nd example of this invention.

[Drawing 5]It is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 3rd example of this invention.

[Drawing 6]It is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 4th example of this invention.

[Drawing 7]It is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 5th example of this invention.

[Drawing 8]It is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 6th example of this invention.

[Drawing 9]It is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 7th example of this invention.

[Drawing 10]It is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 8th example of this invention.

[Description of Notations]

1 Substrate

2 - 7 feed screw

Gear for 8 - 10 torque transmission

11 Motor for driving

12-14 Timing belt

15 Gear
16 Sensor
17 Bearing plate
18 Opening
19 Heating machine

EXAMPLE

[Example]Hereafter, one example of this invention is described based on a drawing. Drawing 1 is a schematic diagram showing the composition of the disc shaped substrate conveying machine concerning the 1st example of this invention. In the figure, a screw cutter is given in the same direction, and the two feed screws 2 and 3 are formed so that between the screw threads of each feed screw concerned may fit into the circumference end of the substrate 1 and may support the substrate 1. If the two feed screws 2 and 3 turn to a clockwise uniform direction simultaneously, respectively, the substrate 1 will be conveyed in the direction concerned in response to power along between the screw threads of the feed screw 2 in the direction of figure Nakamigi. Under the present circumstances, the round bar which is not illustrated is inserted in the center hole of the substrate 1, and the substrate 1 is supported by this round bar. Therefore, the substrate 1 is in direct proportion to the rotation of the rotating feed screws 2 and 3, and is conveyed.
[0010]Drawing 2 is a sectional view showing an example of a feed screw. The feed screw in which the feed screw shown in (a) of the figure is shown at (b) of a coarse thread and the figure is a trapezoidal thread. When both the pitches of both feed screws are 3 mm, in the case of a coarse thread, the flute width size of a feed screw is 0.75 mm, and, in the case of a trapezoidal thread, becomes broad with 1.1 mm. When 3 mm of screw pitches are specified, the coarse thread of the outer diameter of a feed screw is 24 mm or 27 mm, and, as for the trapezoidal thread, 12 mm or 14 mm are specified to JIS. That is, to a vertical axis, if the shape of the thread groove of a feed screw is symmetrical, it does not need to be good and it is not necessary to limit it to an above-mentioned coarse thread and trapezoidal thread. By using the feed screw of the thread groove which has such shape, the disc shaped substrate which it was lost that uneven stress is added before cooling to disc shaped substrates, such as CD of the quite soft state immediately after shaping, and was stabilized can be manufactured.
[0011]Drawing 3 is a sectional view showing the example of arrangement of the feed screw in the disc shaped substrate conveying machine concerning the 2nd example of this invention. The disc shaped substrate conveying machine of the 2nd example shown in the figure, The round bar which lets the center hole of the substrate 1 in the 1st example pass was eliminated, the gear of the same path and a number of teeth (teeth pitch) was attached to the end of the four feed screws 4-7 to which the screw cutter was given in the same direction, and each feed screw is arranged in the lower half of the circumference end of the substrate 1. The feed screws 4 and 7 are arranged at the circumference end which crosses the horizon which passes along the center of the substrate 1, respectively, as for the feed screw 5, it is arranged from the locating position of the feed screw 4 to a drawing top counterclockwise rotation at a 60-degree position, and the feed screw 6 is arranged from the locating position of the feed screw 5 to the drawing top counterclockwise rotation at a 60-degree position, respectively. And so that (a) of

drawing 4 in which the x-x' fragmentary sectional view in (b) of drawing 4 is shown may show, The gear 8 for torque transmission meshes with each gear of each feed screws 4 and 5, the gear 9 for torque transmission meshes with each gear of each feed screws 5 and 6, and the gear 10 for torque transmission meshes with each gear of each feed screws 6 and 7, and it intervenes, respectively. The axis of rotation of the motor for driving 11 is combined with the axis of the gear 9 for torque transmission, and the motor for driving 11 makes a figure Nakagami clockwise rotation rotate the gear 9 for torque transmission. Therefore, if the motor for driving 11 drives, the gear 9 for torque transmission will rotate clockwise, and the gear of the feed screws 5 and 6 which meshes with the gear 9 for torque transmission will rotate counterclockwise. And the gear 8 for torque transmission which meshes with the gear of the feed screw 5 rotates clockwise, and the gear of the feed screw 4 which meshes with the gear 8 for torque transmission rotates counterclockwise. Similarly the gear 10 for torque transmission which meshes with the gear of the feed screw 6 rotates clockwise, and the gear of the feed screw 7 which meshes with the gear 10 for torque transmission rotates counterclockwise. Namely, if the motor for driving 11 is rotated clockwise, the four feed screws 4-7 will rotate at the same speed as a counterclockwise rotation altogether via the gears 8, 9, and 10 for torque transmission. As a result, as shown in (b) of drawing 4, the substrate 1 which intervenes among four screw threads is conveyed along the thread groove to rotate, carrying out axial rotation in the direction of the arrow A. Although it is for the locating position of the feed screw shown in drawing 3 realizing conveyance uniformly geared and stabilized in the substrate, this locating position is an example and it is not necessary to limit it to this.

[0012]Drawing 5 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 3rd example of this invention. The disc shaped substrate conveying machine of the 3rd example shown in the figure is the example which used the timing belt, in order to eliminate the gear for torque transmission in the 2nd example, to attach the belt pulley of the diameter of the same to the end of the four feed screws 4-7 to which the screw cutter was given in the same direction and to transmit rotation to each feed screw. The timing belt 12 is constructed in parallel credit between the feed screw 4 and the feed screw 5, and the timing belt 14 is constructed in parallel credit between the feed screw 6 and the feed screw 7 so that (a) of drawing 5 in which the y-y' fragmentary sectional view in (b) of drawing 5 is shown may show. The timing belt 13 rolls almost all the belt pulleys attached to the axis of rotation of the feed screw 5, the feed screw 6, and the motor for driving 11, and is constructed. If the motor for driving 11 is rotated counterclockwise, the belt pulley of the feed screws 5 and 6 will rotate counterclockwise via the timing belt 13. When the belt pulley of the feed screw 5 rotates counterclockwise, the belt pulley of the feed screw 4 rotates counterclockwise via the timing belt 12. When the belt pulley of the feed screw 6 rotates counterclockwise, the belt pulley of the feed screw 7 rotates counterclockwise via the timing belt 14. Namely, if the motor for driving 11 is rotated counterclockwise, the four feed screws 4-7 will rotate at the same speed as a counterclockwise rotation altogether via the timing belts 12, 13, and 14. As a result, as shown in (b) of drawing 5, the substrate 1 which intervenes among four delivery screw threads is conveyed along the thread groove to rotate, carrying out axial rotation in the direction of the arrow A. When the direction of a screw cutter of the feed screw 5 and the feed screw 6 is made reverse [the direction of a screw cutter of the

feed screw 4 and the feed screw 7] like the 4th example mentioned later, The timing belts 12 and 14 can be made into cross-joint credit, and the hand of cut of the feed screw 5 and the feed screw 6 can also be made into the reverse of the hand of cut of the feed screw 4 and the feed screw 7.

[0013]Drawing 6 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 4th example of this invention. The disc shaped substrate conveying machine of the 4th example shown in the figure, It is the example which attached the gear of the same path and a number of teeth (teeth pitch) to the end of the four feed screws 4-7 to which the screw cutter was given so that the gear for torque transmission in the 2nd example might be eliminated and it might become reverse [the direction of a screw cutter of the feed screw 4 and the feed screw 7] about the direction of a screw cutter of the feed screw 5 and the feed screw 6. It has geared with the gear 15 with which the gear of the feed screw 4 was attached to the gear of the feed screw 5, and the gear of the feed screw 5 was attached to the axis of rotation of the motor for driving 11, respectively so that (a) of drawing 6 in which the z-z' fragmentary sectional view in (b) of drawing 6 is shown may show. The gear attached to the axis of rotation of the motor for driving 11 meshes with the gear of the feed screw 6, and the gear of the feed screw 6 meshes with the gear of the feed screw 7, respectively. If the motor for driving 11 is rotated counterclockwise, the gear of the feed screws 5 and 6 will rotate clockwise. When the gear of the feed screw 5 rotates clockwise, the gear of the feed screw 4 rotates counterclockwise. When the gear of the feed screw 6 rotates clockwise, the gear of the feed screw 7 rotates counterclockwise. Namely, if the motor for driving 11 is rotated counterclockwise, the feed screws 5 and 6 will rotate the feed screws 4 and 7 at the respectively same speed as a counterclockwise rotation clockwise. As a result, as shown in (b) of drawing 6, the substrate 1 which intervenes among four screw threads is conveyed along the thread groove to rotate, carrying out axial rotation in the direction of the arrow A. According to the disc shaped substrate conveying machine of the 4th example that has such composition, only the part of the path of the gear which formation part number of articles can be lessened, and is not installed can make the height of a device low by not providing the gear for torque transmission like the 2nd example.

[0014]Drawing 7 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 5th example of this invention. In the same predetermined area range, the disc shaped substrate conveying machine of the 5th example shown in the figure makes the pitch of the screw thread of each feed screw coarser than the pitch of the screw thread of center portions other than the area range concerned from the both ends of each feed screw. Thus, by making coarse the pitch of the screw thread of each feed screw from the both ends of each feed screw in the same predetermined area range, Since the distance between a certain amount of substrates can be maintained when performing an injection and discharge of the substrate 1 (i.e., when inserting the substrate 1 perpendicularly or pulling out vertically), an adjoining substrate is not touched.

[0015]Drawing 8 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 6th example of this invention. The disc shaped substrate conveying machine of the 6th example shown in the figure forms the sensor 16 which detects the one substrate 1 in the neighborhood which discharges the

substrate 1. In the cooling process and stoving process of the substrate 1 that the disc shaped substrate conveying machine of this invention is used, in order to conduct quality inspection of a substrate, sampling of a substrate may be performed by the suitable interval. Then, when the post process etc. are being automated, in the part sampled for the quality inspection concerned, there is no substrate 1 which should exist and trouble will be exerted on a post process. Then, in this example, only when it detects that the sensor 10 has the one substrate 1 in a discharge part, discharge processing is performed. Therefore, substrate 1 how many sheet thing for which trouble is exerted on a post process even if sampled is lost.

[0016]Drawing 9 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 7th example of this invention. The disc shaped substrate conveying machine of the 7th example shown in the figure forms the opening 18 larger than the outside of the substrate 1 in the bearing plate 17 of the screw of the device casing in an eject direction, and uses the screw supporter of the bearing plate 17 as a bearing smaller than the outside of a feed screw. In this example which has such composition, it becomes possible [also discharging the substrate 1 to the direction of movement of the substrate 1] for discharge by the vertical switch drawal of a substrate to be performed from the first.

[0017]Drawing 10 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 8th example of this invention. Heating machine 19 the very thing is provided under the carrying path of the substrate 1 at the disc shaped substrate conveying machine of the 8th example shown in the figure. In this example which has such composition, the miniaturization of the further device can be attained by including in a cooler or the heating machine itself.

[0018]This invention is not limited to the above-mentioned example, and in a claim, if it is a statement, neither modification of a variety nor a replaceable thing can be overemphasized.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]Especially this invention relates to the conveying machine of the optical disc in an optical disk manufacturing process about a disc shaped substrate conveying machine.

[0002]

[Description of the Prior Art]The cooling process and stoving process of the substrate are included in the manufacturing process of CD-R and rewritable CD-RW which can be added also in a compact disk. DVD of the mass media which will spread from now on is also completely the same. The cooling process and stoving process of this substrate usually take the time for tens of [several to] minutes. However, since CD and the production tact of a DVD medium are usually several seconds, they will put about 100 substrates into the cooling process or the stoving process. The conveyance gestalt of thin disc shaped substrates, such as CD and DVD, has a common transportation method common [every / which is performed where it made the substrate common and it is placed]. however, the length of a process [in / common / every / this / with a

transportation method / a cooling process or a stoving process] -- if it forces, the size of the whole device will become huge. Then, in these processes, in order to pack a substrate interval, the transportation method is adopted every [which conveys a substrate in the state where it stood vertically] length. However, every length of this, by a transportation method, if the distance between substrates is packed too much, ventilation will worsen and cooling or the stoving effect will decrease. For this reason, where a substrate is stood, in order to maintain a substrate interval suitable, a magazine cassette and the jig held where one substrate is stood are arranged to a constant interval, and the substrate conveying method of the carousel type to which that magazine cassette and jig are moved is used.

[0003]

[Problem(s) to be Solved by the Invention]However, in these methods, there is a problem that substrate temperature will not become uniform since the fixed state of a substrate is constant, and device size will become large. There is a lamination process that nothing is to CD in DVD, there are some which need the cure time for tens of minutes according to the kind of adhesives used at this process, predetermined time storage must be carried out and the too same problem as **** is in the process in that case, and a device.

[0004]This invention is for solving these problems.

The purpose is to provide the disc shaped substrate conveying machine which can hold an always suitable substrate interval, rotating a substrate.

[0005]

[Means for Solving the Problem]Two or more feed screws arranged in parallel to a longitudinal direction of a medial axis of a disc shaped substrate so that a peripheral end of a disc shaped substrate stood perpendicularly may intervene between screw threads, in order that this invention may solve said problem, Conveying having a rotational driving means which carries out axial rotation, rotating each feed screw at the same speed by a rotational driving means, and making the same transportation direction rotate a disc shaped substrate has the feature. Therefore, during conveyance, since a substrate is always rotating, substrate temperature can be heated or cooled uniformly, and the whole device can be miniaturized.

[0006]By making shape of a thread groove of a feed screw into symmetrical shape to a perpendicular direction, giving stress unnecessary for a substrate can be lost, curvature of a substrate, distortion, etc. can be prevented, and a substrate which has the good characteristic can be manufactured.

[0007]By changing a screw pitch of a feed screw in a predetermined field, a screw pitch of a feed screw in a carrying path of processes, such as an injection and discharge, can be made large, for example, distance between substrates can be maintained, and a substrate in processes, such as an injection and discharge, can be taken in and out easily.

[0008]

[Embodiment of the Invention]Two or more feed screws arranged in parallel to the longitudinal direction of the medial axis of a disc shaped substrate so that the peripheral end of the disc shaped substrate stood perpendicularly may intervene between screw threads, It has a rotational driving means which carries out axial rotation, and it conveys, rotating each feed screw at the same speed, and making the same transportation direction rotate a disc shaped substrate by a rotational driving means.

[0009]
[Example]Hereafter, one example of this invention is described based on a drawing. Drawing 1 is a schematic diagram showing the composition of the disc shaped substrate conveying machine concerning the 1st example of this invention. In the figure, a screw cutter is given in the same direction, and the two feed screws 2 and 3 are formed so that between the screw threads of each feed screw concerned may fit into the circumference end of the substrate 1 and may support the substrate 1. If the two feed screws 2 and 3 turn to a clockwise uniform direction simultaneously, respectively, the substrate 1 will be conveyed in the direction concerned in response to power along between the screw threads of the feed screw 2 in the direction of figure Nakamigi. Under the present circumstances, the round bar which is not illustrated is inserted in the center hole of the substrate 1, and the substrate 1 is supported by this round bar. Therefore, the substrate 1 is in direct proportion to the rotation of the rotating feed screws 2 and 3, and is conveyed.
[0010]Drawing 2 is a sectional view showing an example of a feed screw. The feed screw in which the feed screw shown in (a) of the figure is shown at (b) of a coarse thread and the figure is a trapezoidal thread. When both the pitches of both feed screws are 3 mm, in the case of a coarse thread, the flute width size of a feed screw is 0.75 mm, and, in the case of a trapezoidal thread, becomes broad with 1.1 mm. When 3 mm of screw pitches are specified, the coarse thread of the outer diameter of a feed screw is 24 mm or 27 mm, and, as for the trapezoidal thread, 12 mm or 14 mm are specified to JIS. That is, to a vertical axis, if the shape of the thread groove of a feed screw is symmetrical, it does not need to be good and it is not necessary to limit it to an above-mentioned coarse thread and trapezoidal thread. By using the feed screw of the thread groove which has such shape, the disc shaped substrate which it was lost that uneven stress is added before cooling to disc shaped substrates, such as CD of the quite soft state immediately after shaping, and was stabilized can be manufactured.
[0011]Drawing 3 is a sectional view showing the example of arrangement of the feed screw in the disc shaped substrate conveying machine concerning the 2nd example of this invention. The disc shaped substrate conveying machine of the 2nd example shown in the figure, The round bar which lets the center hole of the substrate 1 in the 1st example pass was eliminated, the gear of the same path and a number of teeth (teeth pitch) was attached to the end of the four feed screws 4-7 to which the screw cutter was given in the same direction, and each feed screw is arranged in the lower half of the circumference end of the substrate 1. The feed screws 4 and 7 are arranged at the circumference end which crosses the horizon which passes along the center of the substrate 1, respectively, as for the feed screw 5, it is arranged from the locating position of the feed screw 4 to a drawing top counterclockwise rotation at a 60-degree position, and the feed screw 6 is arranged from the locating position of the feed screw 5 to the drawing top counterclockwise rotation at a 60-degree position, respectively. And so that (a) of drawing 4 in which the x-x' fragmentary sectional view in (b) of drawing 4 is shown may show, The gear 8 for torque transmission meshes with each gear of each feed screws 4 and 5, the gear 9 for torque transmission meshes with each gear of each feed screws 5 and 6, and the gear 10 for torque transmission meshes with each gear of each feed screws 6 and 7, and it intervenes, respectively. The axis of rotation of the motor for driving 11 is combined with the axis of the gear 9 for torque transmission, and the motor for driving 11 makes a figure Nakagami clockwise rotation rotate the gear 9 for torque transmission.

Therefore, if the motor for driving 11 drives, the gear 9 for torque transmission will rotate clockwise, and the gear of the feed screws 5 and 6 which meshes with the gear 9 for torque transmission will rotate counterclockwise. And the gear 8 for torque transmission which meshes with the gear of the feed screw 5 rotates clockwise, and the gear of the feed screw 4 which meshes with the gear 8 for torque transmission rotates counterclockwise. Similarly the gear 10 for torque transmission which meshes with the gear of the feed screw 6 rotates clockwise, and the gear of the feed screw 7 which meshes with the gear 10 for torque transmission rotates counterclockwise. Namely, if the motor for driving 11 is rotated clockwise, the four feed screws 4-7 will rotate at the same speed as a counterclockwise rotation altogether via the gears 8, 9, and 10 for torque transmission. As a result, as shown in (b) of drawing 4, the substrate 1 which intervenes among four screw threads is conveyed along the thread groove to rotate, carrying out axial rotation in the direction of the arrow A. Although it is for the locating position of the feed screw shown in drawing 3 realizing conveyance uniformly geared and stabilized in the substrate, this locating position is an example and it is not necessary to limit it to this.

[0012]Drawing 5 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 3rd example of this invention. The disc shaped substrate conveying machine of the 3rd example shown in the figure is the example which used the timing belt, in order to eliminate the gear for torque transmission in the 2nd example, to attach the belt pulley of the diameter of the same to the end of the four feed screws 4-7 to which the screw cutter was given in the same direction and to transmit rotation to each feed screw. The timing belt 12 is constructed in parallel credit between the feed screw 4 and the feed screw 5, and the timing belt 14 is constructed in parallel credit between the feed screw 6 and the feed screw 7 so that (a) of drawing 5 in which the y-y' fragmentary sectional view in (b) of drawing 5 is shown may show. The timing belt 13 rolls almost all the belt pulleys attached to the axis of rotation of the feed screw 5, the feed screw 6, and the motor for driving 11, and is constructed. If the motor for driving 11 is rotated counterclockwise, the belt pulley of the feed screws 5 and 6 will rotate counterclockwise via the timing belt 13. When the belt pulley of the feed screw 5 rotates counterclockwise, the belt pulley of the feed screw 4 rotates counterclockwise via the timing belt 12. When the belt pulley of the feed screw 6 rotates counterclockwise, the belt pulley of the feed screw 7 rotates counterclockwise via the timing belt 14. Namely, if the motor for driving 11 is rotated counterclockwise, the four feed screws 4-7 will rotate at the same speed as a counterclockwise rotation altogether via the timing belts 12, 13, and 14. As a result, as shown in (b) of drawing 5, the substrate 1 which intervenes among four delivery screw threads is conveyed along the thread groove to rotate, carrying out axial rotation in the direction of the arrow A. When the direction of a screw cutter of the feed screw 5 and the feed screw 6 is made reverse [the direction of a screw cutter of the feed screw 4 and the feed screw 7] like the 4th example mentioned later, The timing belts 12 and 14 can be made into cross-joint credit, and the hand of cut of the feed screw 5 and the feed screw 6 can also be made into the reverse of the hand of cut of the feed screw 4 and the feed screw 7.

[0013]Drawing 6 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 4th example of this invention. The disc shaped substrate conveying machine of the 4th example shown in the figure, It is the

example which attached the gear of the same path and a number of teeth (teeth pitch) to the end of the four feed screws 4-7 to which the screw cutter was given so that the gear for torque transmission in the 2nd example might be eliminated and it might become reverse [the direction of a screw cutter of the feed screw 4 and the feed screw 7] about the direction of a screw cutter of the feed screw 5 and the feed screw 6. It has geared with the gear 15 with which the gear of the feed screw 4 was attached to the gear of the feed screw 5, and the gear of the feed screw 5 was attached to the axis of rotation of the motor for driving 11, respectively so that (a) of drawing 6 in which the z-z' fragmentary sectional view in (b) of drawing 6 is shown may show. The gear attached to the axis of rotation of the motor for driving 11 meshes with the gear of the feed screw 6, and the gear of the feed screw 6 meshes with the gear of the feed screw 7, respectively. If the motor for driving 11 is rotated counterclockwise, the gear of the feed screws 5 and 6 will rotate clockwise. When the gear of the feed screw 5 rotates clockwise, the gear of the feed screw 4 rotates counterclockwise. When the gear of the feed screw 6 rotates clockwise, the gear of the feed screw 7 rotates counterclockwise. Namely, if the motor for driving 11 is rotated counterclockwise, the feed screws 5 and 6 will rotate the feed screws 4 and 7 at the respectively same speed as a counterclockwise rotation clockwise. As a result, as shown in (b) of drawing 6, the substrate 1 which intervenes among four screw threads is conveyed along the thread groove to rotate, carrying out axial rotation in the direction of the arrow A. According to the disc shaped substrate conveying machine of the 4th example that has such composition, only the part of the path of the gear which formation part number of articles can be lessened, and is not installed can make the height of a device low by not providing the gear for torque transmission like the 2nd example.

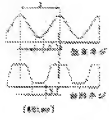
[0014]Drawing 7 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 5th example of this invention. In the same predetermined area range, the disc shaped substrate conveying machine of the 5th example shown in the figure makes the pitch of the screw thread of each feed screw coarser than the pitch of the screw thread of center portions other than the area range concerned from the both ends of each feed screw. Thus, by making coarse the pitch of the screw thread of each feed screw from the both ends of each feed screw in the same predetermined area range, Since the distance between a certain amount of substrates can be maintained when performing an injection and discharge of the substrate 1 (i.e., when inserting the substrate 1 perpendicularly or pulling out vertically), an adjoining substrate is not touched.

[0015]Drawing 8 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 6th example of this invention. The disc shaped substrate conveying machine of the 6th example shown in the figure forms the sensor 16 which detects the one substrate 1 in the neighborhood which discharges the substrate 1. In the cooling process and stoving process of the substrate 1 that the disc shaped substrate conveying machine of this invention is used, in order to conduct quality inspection of a substrate, sampling of a substrate may be performed by the suitable interval. Then, when the post process etc. are being automated, in the part sampled for the quality inspection concerned, there is no substrate 1 which should exist and trouble will be exerted on a post process. Then, in this example, only when it detects that the sensor 10 has the one substrate 1 in a discharge part, discharge processing is performed.

Therefore, substrate 1 how many sheet thing for which trouble is exerted on a post process even if sampled is lost.
[0016]Drawing 9 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 7th example of this invention. The disc shaped substrate conveying machine of the 7th example shown in the figure forms the opening 18 larger than the outside of the substrate 1 in the bearing plate 17 of the screw of the device casing in an eject direction, and uses the screw supporter of the bearing plate 17 as a bearing smaller than the outside of a feed screw. In this example which has such composition, it becomes possible [also discharging the substrate 1 to the direction of movement of the substrate 1] for discharge by the vertical switch drawal of a substrate to be performed from the first.
[0017]Drawing 10 is a sectional view showing the composition of the disc shaped substrate conveying machine concerning the 8th example of this invention. Heating machine 19 the very thing is provided under the carrying path of the substrate 1 at the disc shaped substrate conveying machine of the 8th example shown in the figure. In this example which has such composition, the miniaturization of the further device can be attained by including in a cooler or the heating machine itself.
[0018]This invention is not limited to the above-mentioned example, and in a claim, if it is a statement, neither modification of a variety nor a replaceable thing can be overemphasized.
[0019]
[Effect of the Invention]Two or more feed screws arranged in parallel to the longitudinal direction of the medial axis of a disc shaped substrate so that the peripheral end of the disc shaped substrate stood perpendicularly may intervene between screw threads according to this invention, as explained above, Conveying having a rotational driving means which carries out axial rotation, rotating each feed screw at the same speed by a rotational driving means, and making the same transportation direction rotate a disc shaped substrate has the feature. Therefore, during conveyance, since the substrate is always rotating, substrate temperature can be heated or cooled uniformly, and the whole device can be miniaturized.
[0020]By making shape of the thread groove of a feed screw into symmetrical shape to a perpendicular direction, giving stress unnecessary for a substrate can be lost, the curvature of a substrate, distortion, etc. can be prevented, and the substrate which has the good characteristic can be manufactured.
[0021]By changing the screw pitch of a feed screw in a predetermined field, the screw pitch of the feed screw in the carrying path of processes, such as an injection and discharge, can be made large, for example, the distance between substrates can be maintained, and the substrate in processes, such as an injection and discharge, can be taken in and out easily.

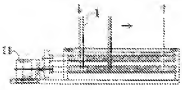
【図１】

【図２】

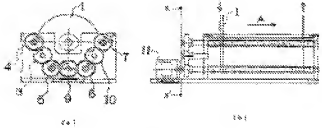


【図３】

【図７】



【図４】



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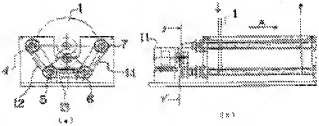

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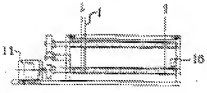

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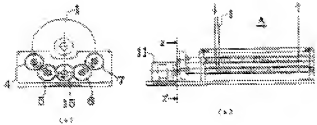
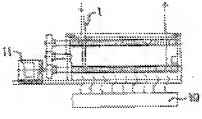


【図１０】



【図９】